Tamkang University Academic Year 114, 1st Semester Course Syllabus

Course Title	ROBOT MOTION AND CONTROL	Instructor	JEONG JAESIK
Course Class	TKFXB3A DEPARTMENT OF ARTIFICIAL INTELLIGENCE, 3A	Details	◆ General Course ◆ Selective ◆ One Semester ◆ 3 Credits
Relevance to SDGs	SDG8 Decent work and economic growth SDG9 Industry, Innovation, and Infrastructure SDG17 Partnerships for the goals		

Departmental Aim of Education

Ⅰ. Students may analyze problems in applied science based on the fundamental knowledge of programming, mathematics, and artificial intelligence.

Ⅱ. Students may plan and implement an AI system following the procedures of problem analysis, experiment testing, data visualizing, derivation and deduction.

Ⅲ. Educate the students to be AI engineers who may accomplish their missions indepedently and may collaborate with their colleagues in the workplace.

Ⅳ. Students may have basic skills and global competence for career diversification, and may keep lifelong learning.

Subject Departmental core competences

A. Professional analysis.(ratio:30.00)

B. Practical application.(ratio:30.00)

C. Professional attitude.(ratio:25.00)

D. Global Mobility.(ratio:15.00)

Subject Schoolwide essential virtues

1. A global perspective. (ratio:10.00)
2. Information literacy. (ratio:30.00)
3. A vision for the future. (ratio:20.00)
4. Moral integrity. (ratio:10.00)
5. Independent thinking. (ratio:10.00)
6. A cheerful attitude and healthy lifestyle. (ratio:5.00)
7. A spirit of teamwork and dedication. (ratio:10.00)
8. A sense of aesthetic appreciation. (ratio:5.00)

Course Introduction	This course explores the fundamental principles of robot motion and control, covering kinematics, dynamics, control strategies, and motion planning. Students will learn ROS2, Python programming, and simulation tools for implementing real-world robotic applications. Topics include forward and inverse kinematics, PID and model-based control, and trajectory generation. By the end of the course, students will have acquired the skills to effectively develop, simulate, and control robotic systems.

The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.
II.Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.
III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

No.	Teaching Objectives	objective methods
1	1. Learning Foundational Knowledge Technical Skills in Robotics 2. Problem-solving skills to develop motion and control 3. Hands-on experiments with ROS2 and simulation environment	Cognitive

The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCD	12345678	Lecture, Practicum, Experience	Testing, Study Assignments, Discussion(including classroom and online), Practicum, Activity Participation

Course Schedule

Week	Date	Course Contents	Note
1	114/09/15 ~ 114/09/21	Introduction to Robot Motion and Control	
2	114/09/22 ~ 114/09/28	Review Programming for Robotics	
3	114/09/29 ~ 114/10/05	Introduction to ROS2	

4	114/10/06 ~ 114/10/12	ROS2 Tools & Simulation	
5	114/10/13 ~ 114/10/19	Understanding Robot Models – TF & URDF	
6	114/10/20 ~ 114/10/26	Robot Kinematics – Forward Kinematics	
7	114/10/27 ~ 114/11/02	Robot Kinematics – Inverse Kinematics	
8	114/11/03 ~ 114/11/09	Midterm Exam	
9	114/11/10 ~ 114/11/16	Robot Kinematics – Mobile Robot Kinematics	
10	114/11/17 ~ 114/11/23	Introduction to Feedback Control	
11	114/11/24 ~ 114/11/30	PID Control	
12	114/12/01 ~ 114/12/07	Trajectory Generation	
13	114/12/08 ~ 114/12/14	Motion & Path Planning	
14	114/12/15 ~ 114/12/21	AI in Motion and Control	
15	114/12/22 ~ 114/12/28	Holiday (12/25)	
16	114/12/29 ~ 115/01/04	Hoilday (1/1)	
17	115/01/05 ~ 115/01/11	Final Exam	
18	115/01/12 ~ 115/01/18	Flexible Teaching Week for Teachers	

Key capabilities	self-directed learning Information Technology Problem solving
Interdisciplinary	STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)
Distinctive teaching	Project implementation course Learning technologies (such as AR/VR,etc.) incorporated to physical courses
Course Content	Computer programming or Computer language (students have hands-on experience in related projects) Logical Thinking AI application

Requirement	
Textbooks and Teaching Materials	Self-made teaching materials:Presentations
References	
Grading Policy	◆ Attendance： 10.0 % ◆ Mark of Usual：10.0 % ◆ Midterm Exam： 20.0 % ◆ Final Exam： 30.0 % ◆ Other〈Final Project〉：30.0 %
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at https://web2.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php. ※"Adhere to the concept of intellectual property rights" and "Do not illegally photocopy, download, or distribute." Using original textbooks is advised. It is a crime to improperly photocopy others' publications.